



CARNEGIE MELLON UNIVERSITY



The contribution of secondary organic aerosol to PM_{2.5} concentrations in Pittsburgh

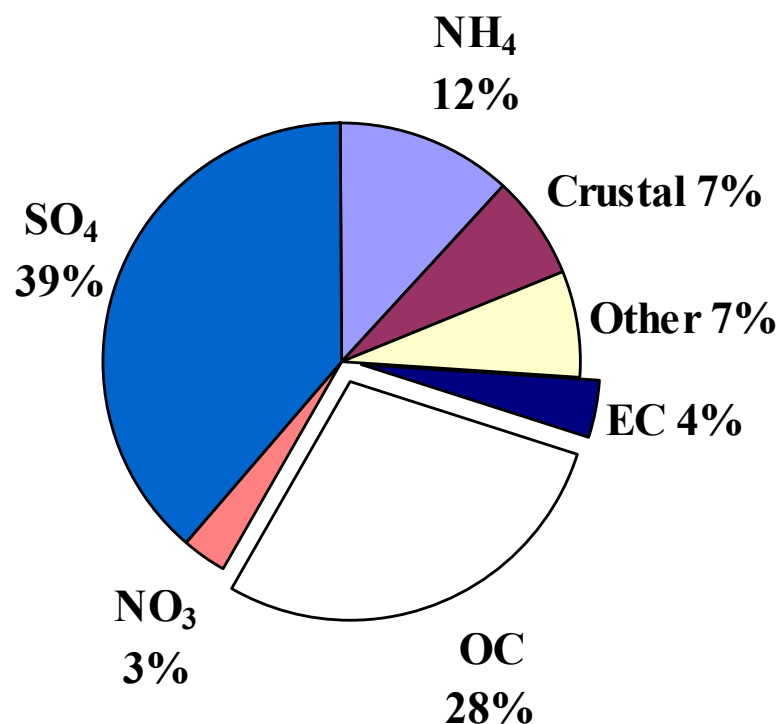
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¹ Carnegie Mellon University, Pittsburgh, PA

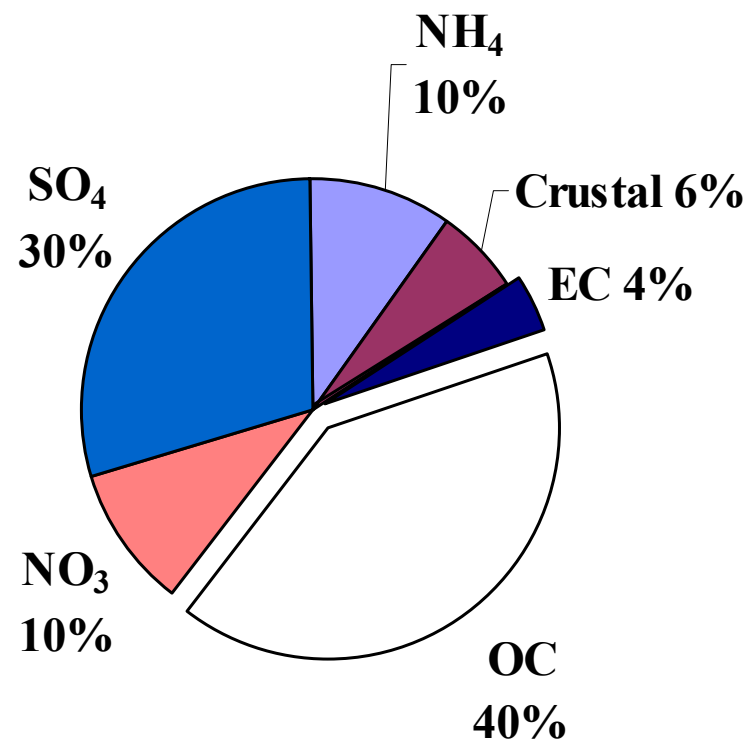
² Rutgers University, New Brunswick, NJ



PM_{2.5} composition PAQS.



July 2001, 20 $\mu\text{g}/\text{m}^3$



December 2001, 10 $\mu\text{g}/\text{m}^3$



Primary vs. Secondary OC

- EC can be used as tracer for primary OC.

primary OC \Rightarrow $[OC]_p = \left[\frac{OC}{EC} \right]_p \cdot [EC] - b$

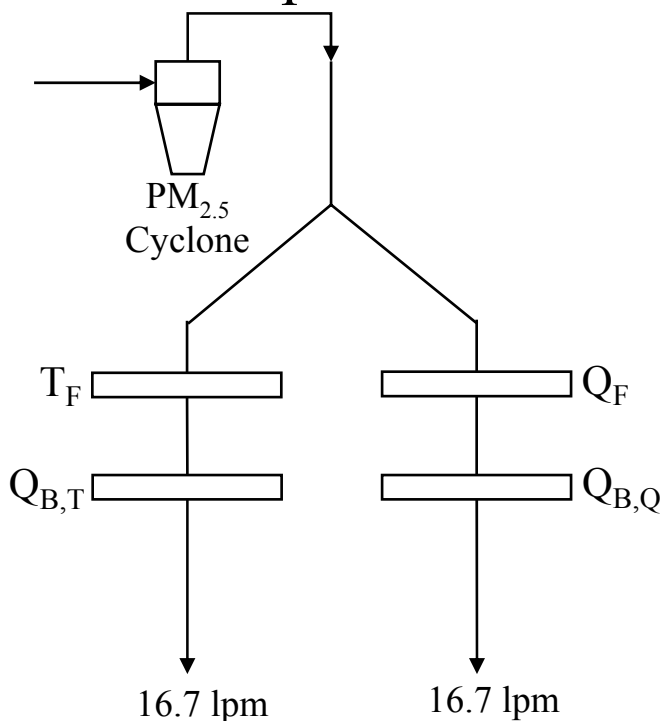
secondary OC \Rightarrow $[OC]_s = [OC] - [OC]_p$

- Ambient Samples ($[OC]$ and $[EC]$)
- Determine ratio of primary emissions $\left[\frac{OC}{EC} \right]_p$
and determine intercept b

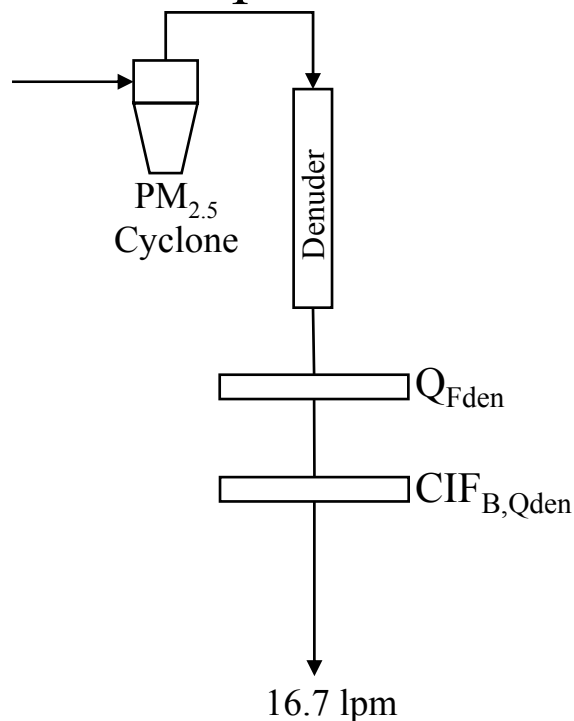


OC and EC Sampler Configurations (PAQS)

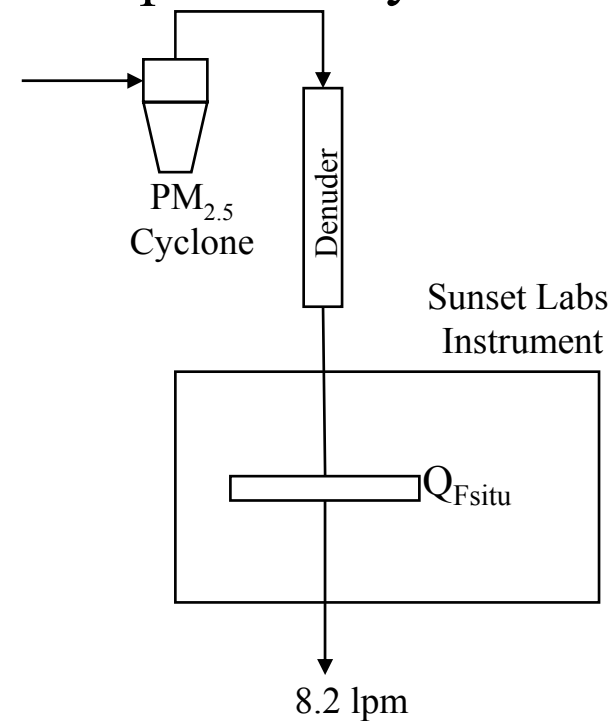
Undenuded Sampler



Denuded Sampler



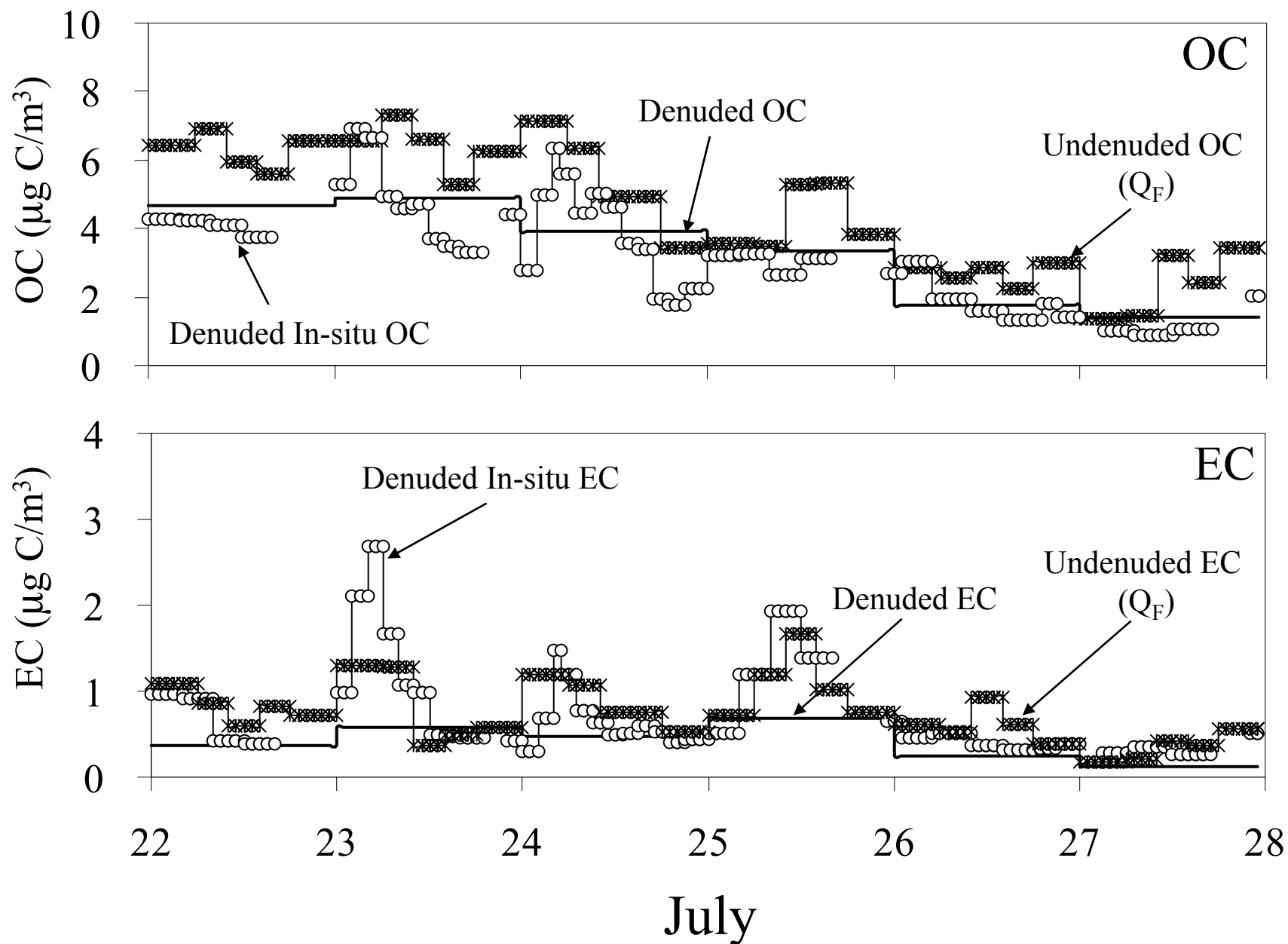
Denuded In-situ Sampler-Analyzer



- All samples analyzed by NIOSH protocol and TOT method

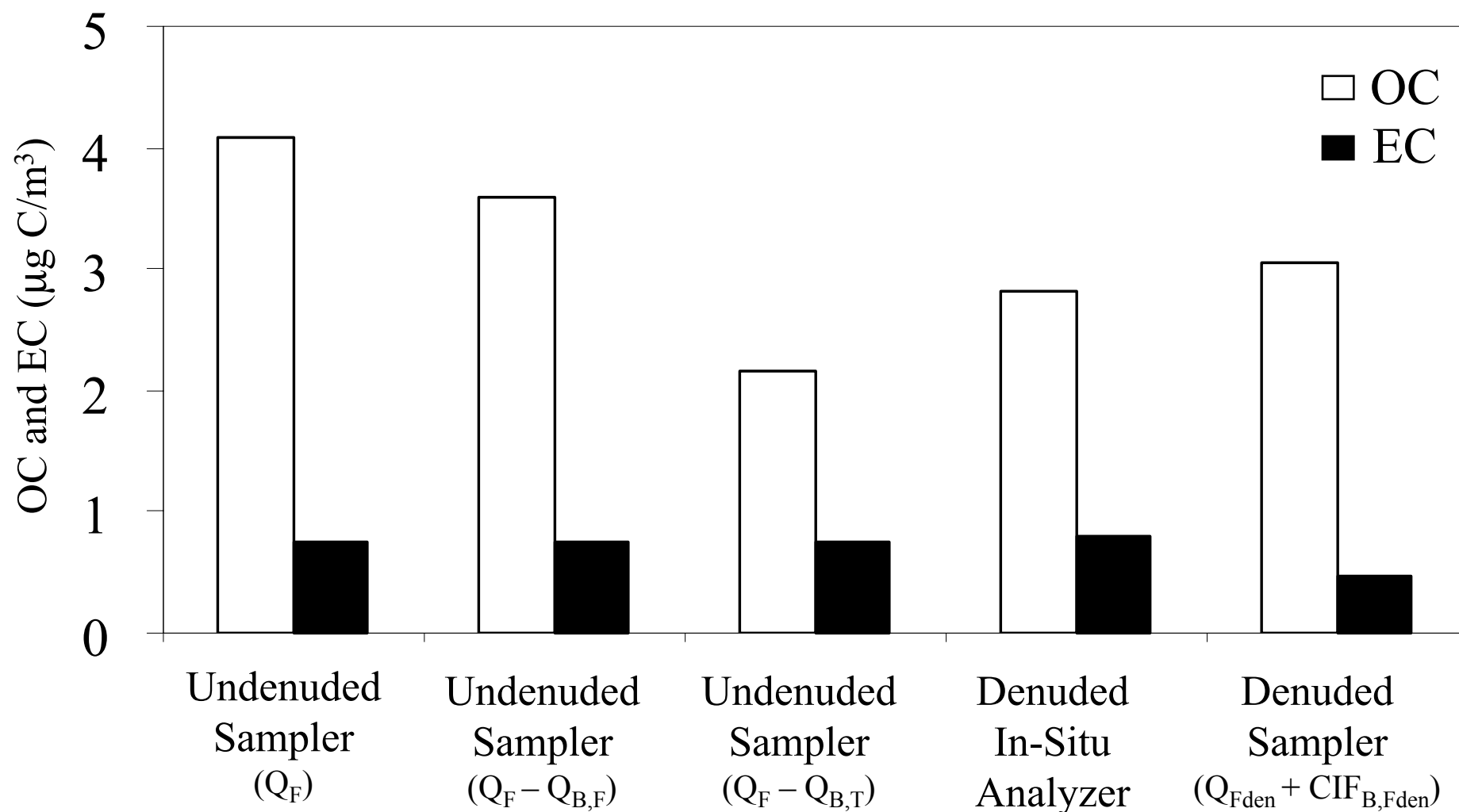


OC and EC Measurements



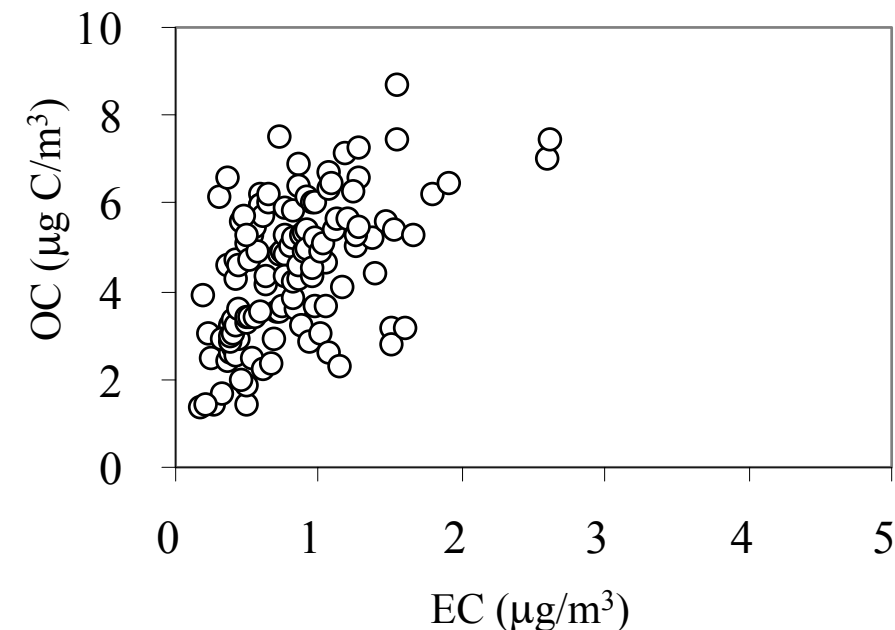


Average OC and EC concentrations (PAQS, summer intensive 2001)



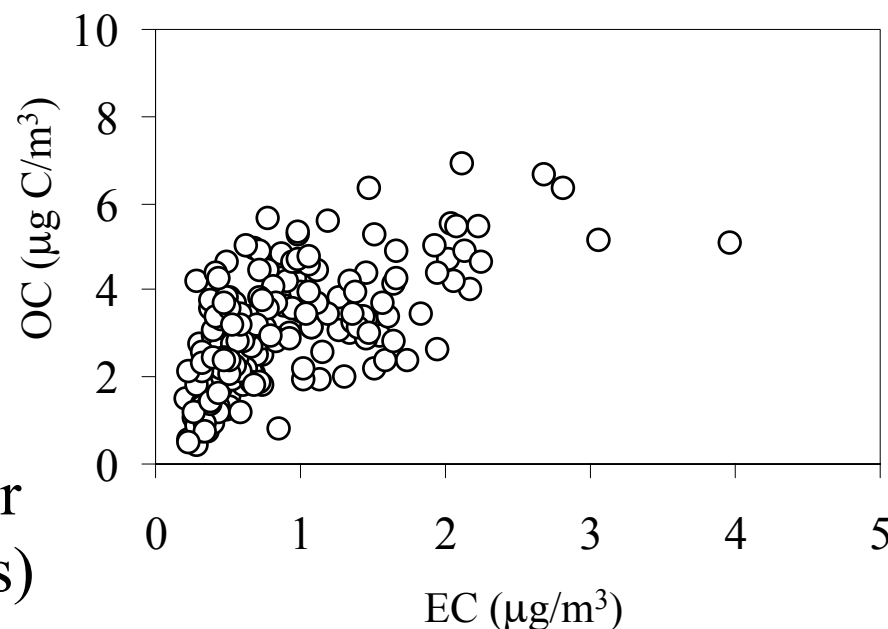


High time resolution measurements, summer intensive 2001



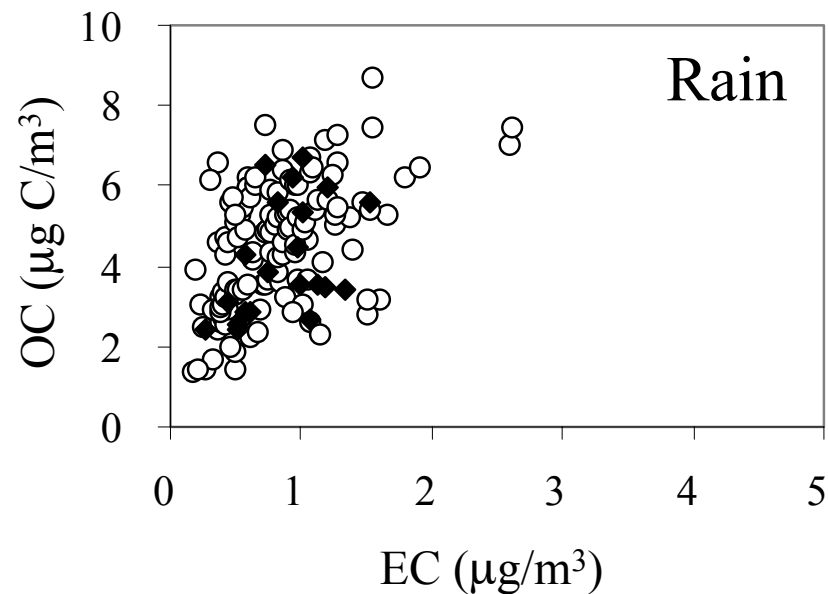
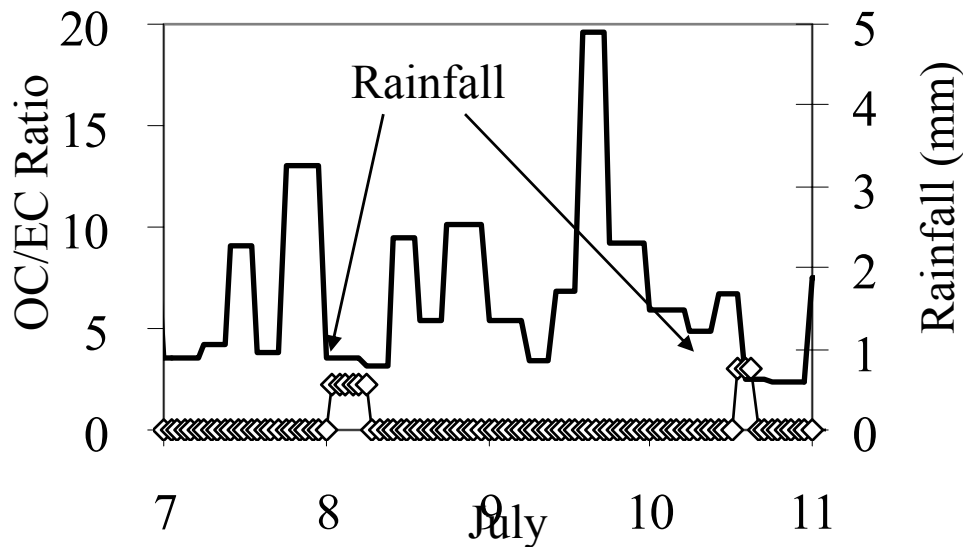
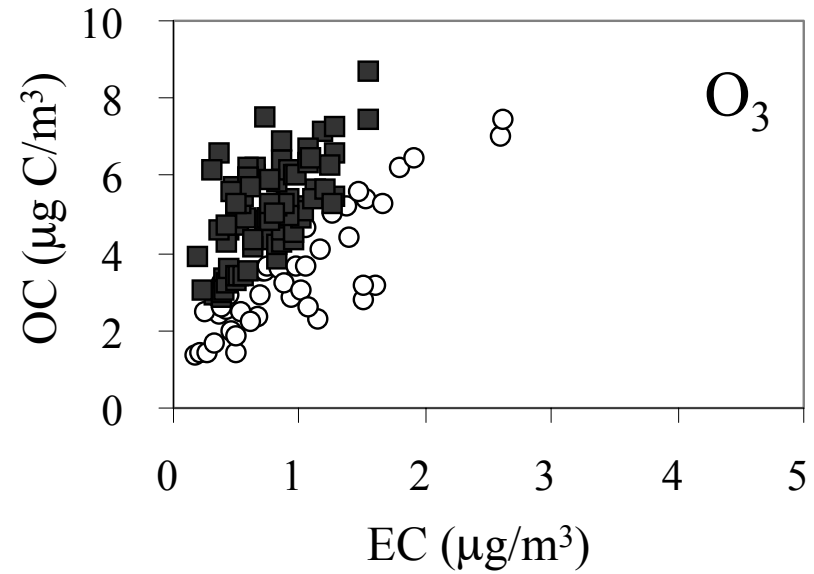
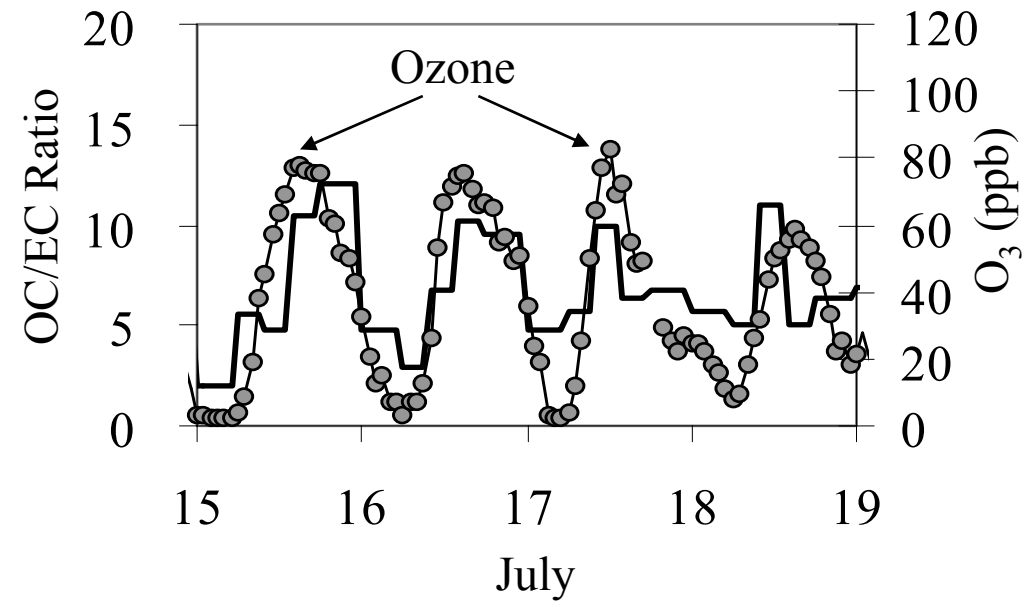
Undenuded Sampler,
 Q_F (4-6 hrs samples)

Denuded
In-situ Analyzer
(2-4 hrs samples)



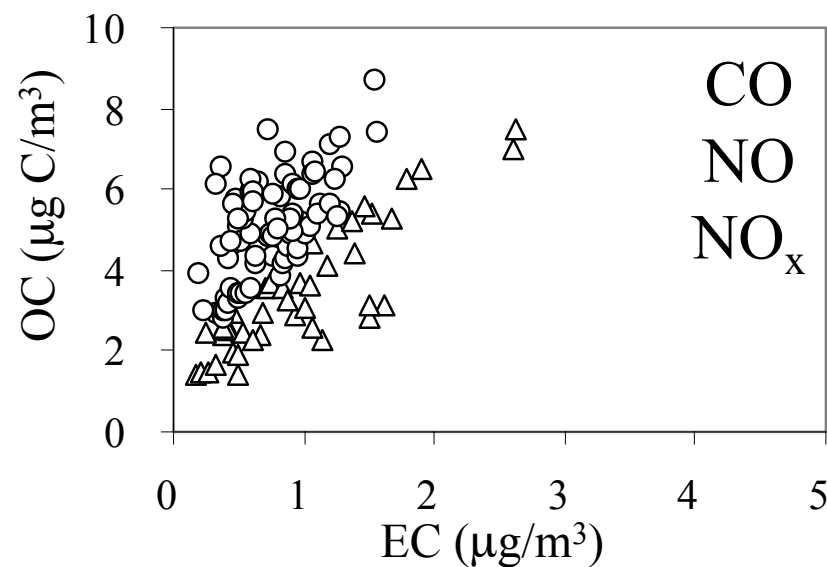
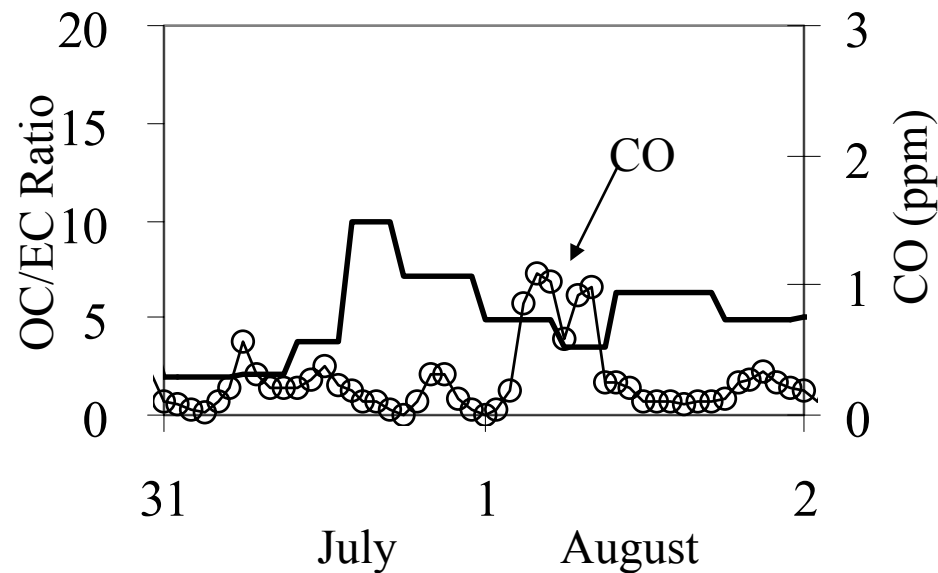
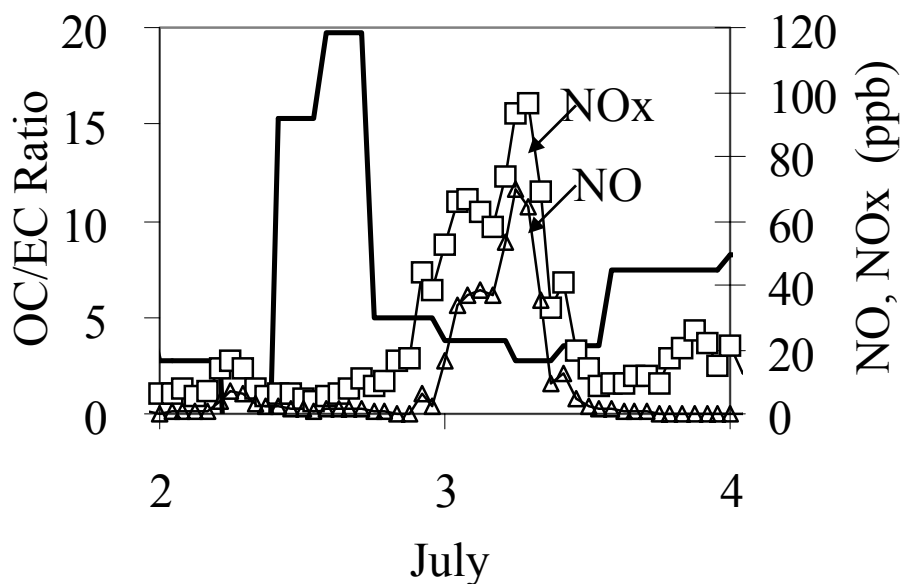


Gas tracers



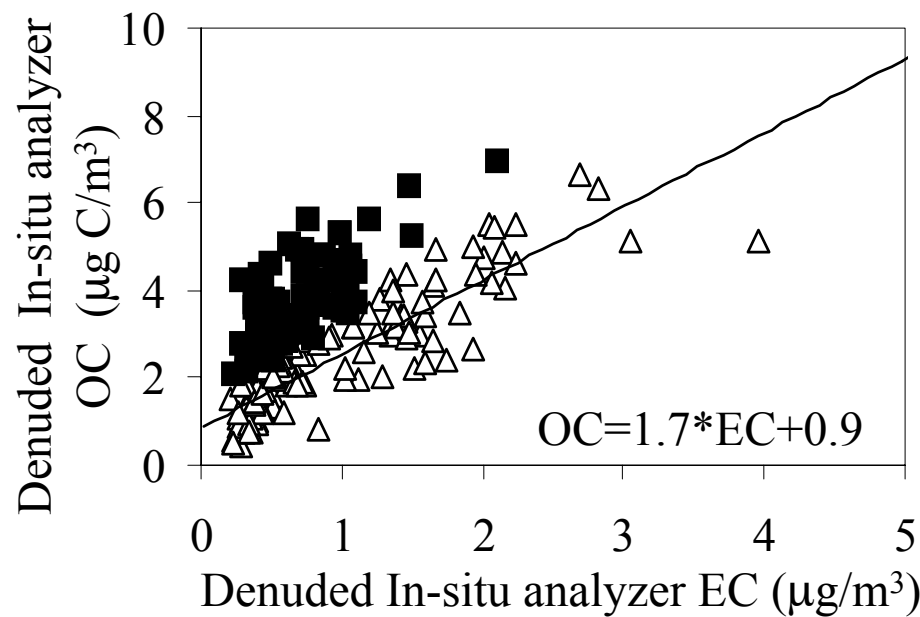
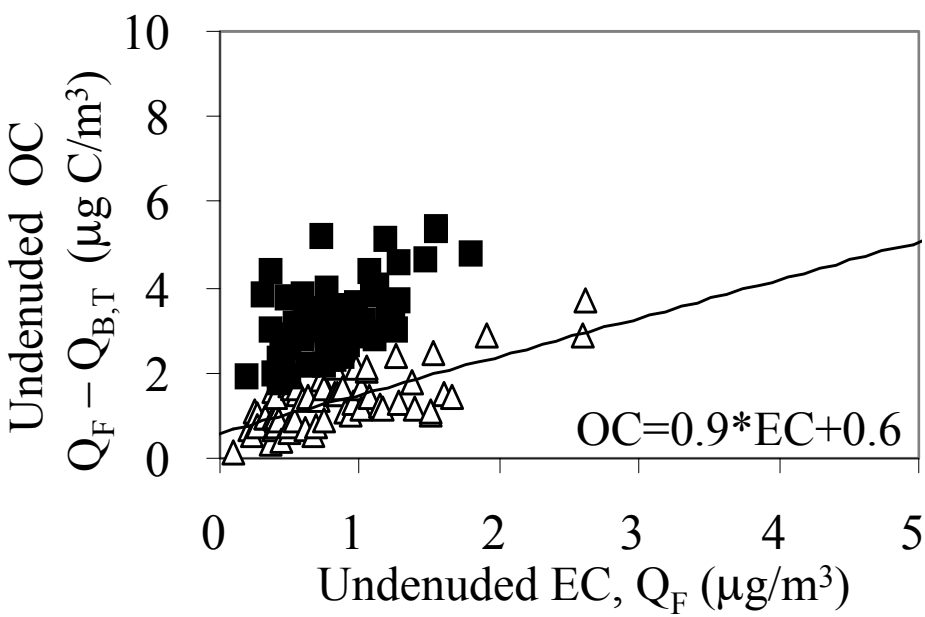
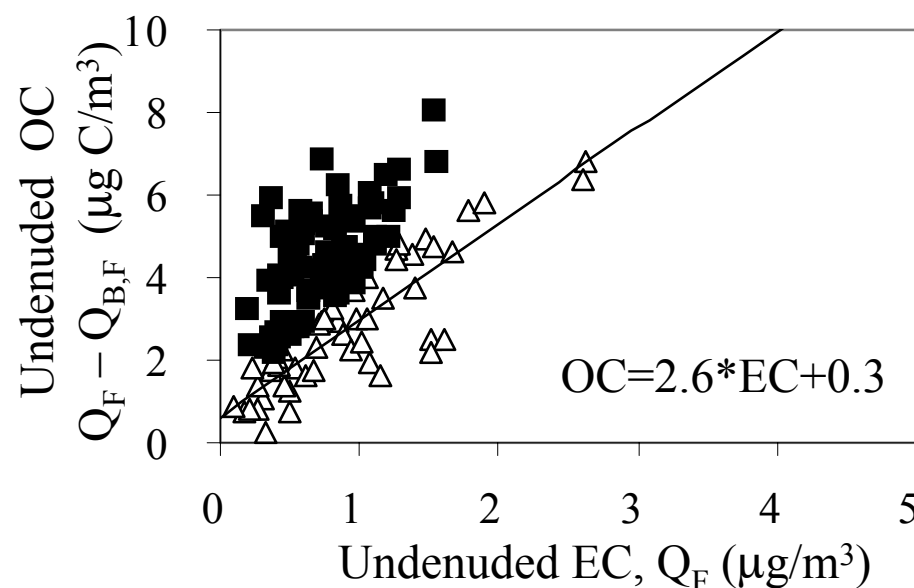
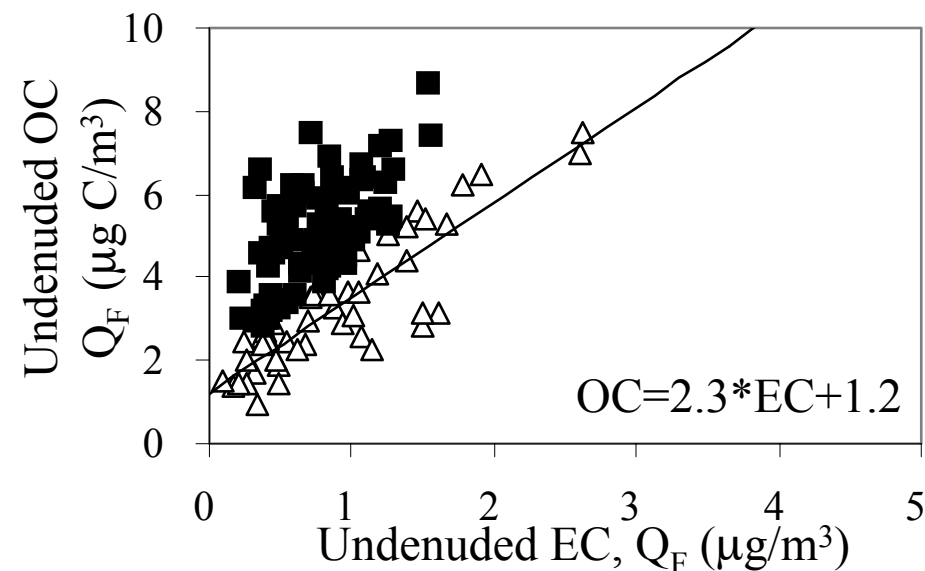


Gas tracers

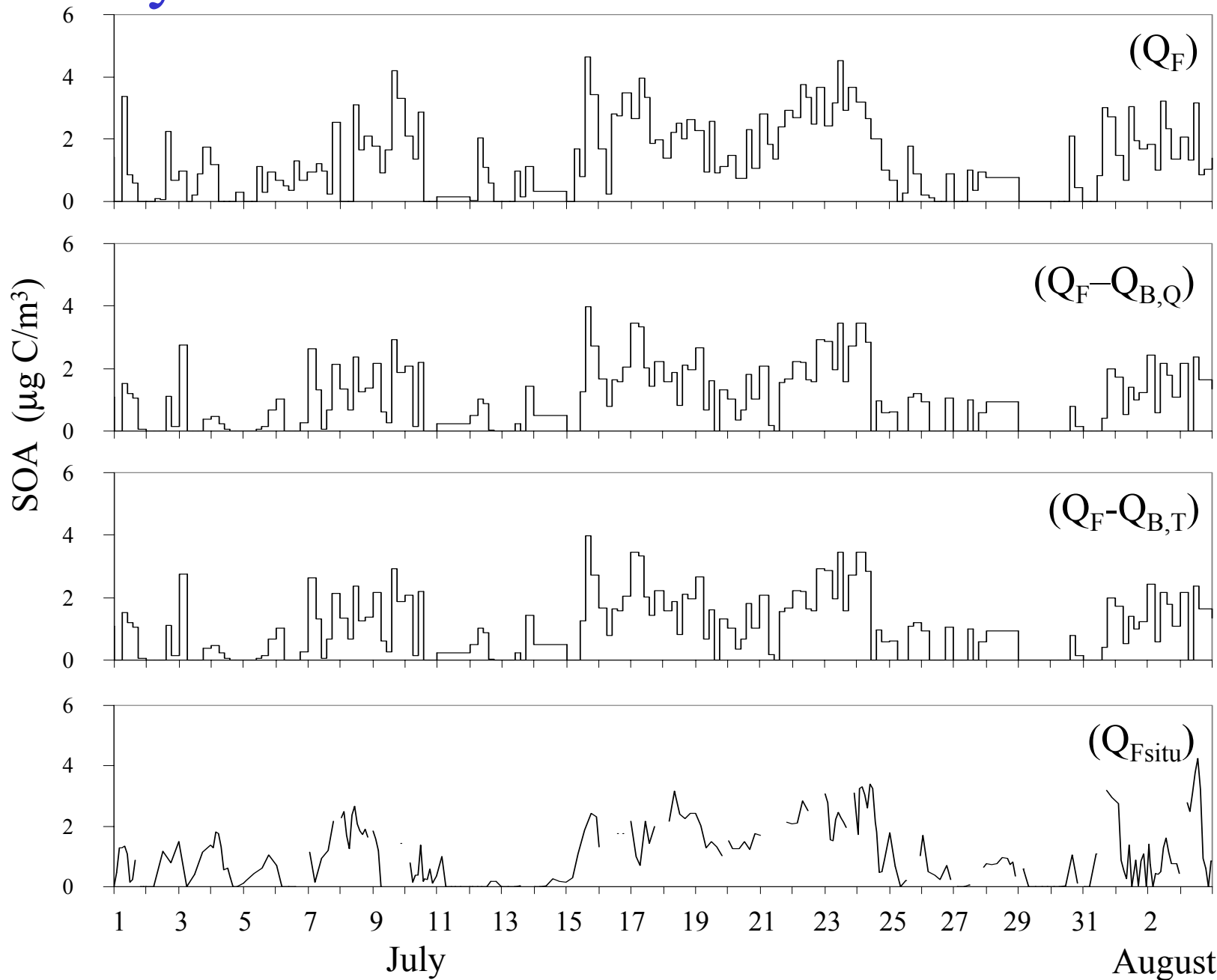




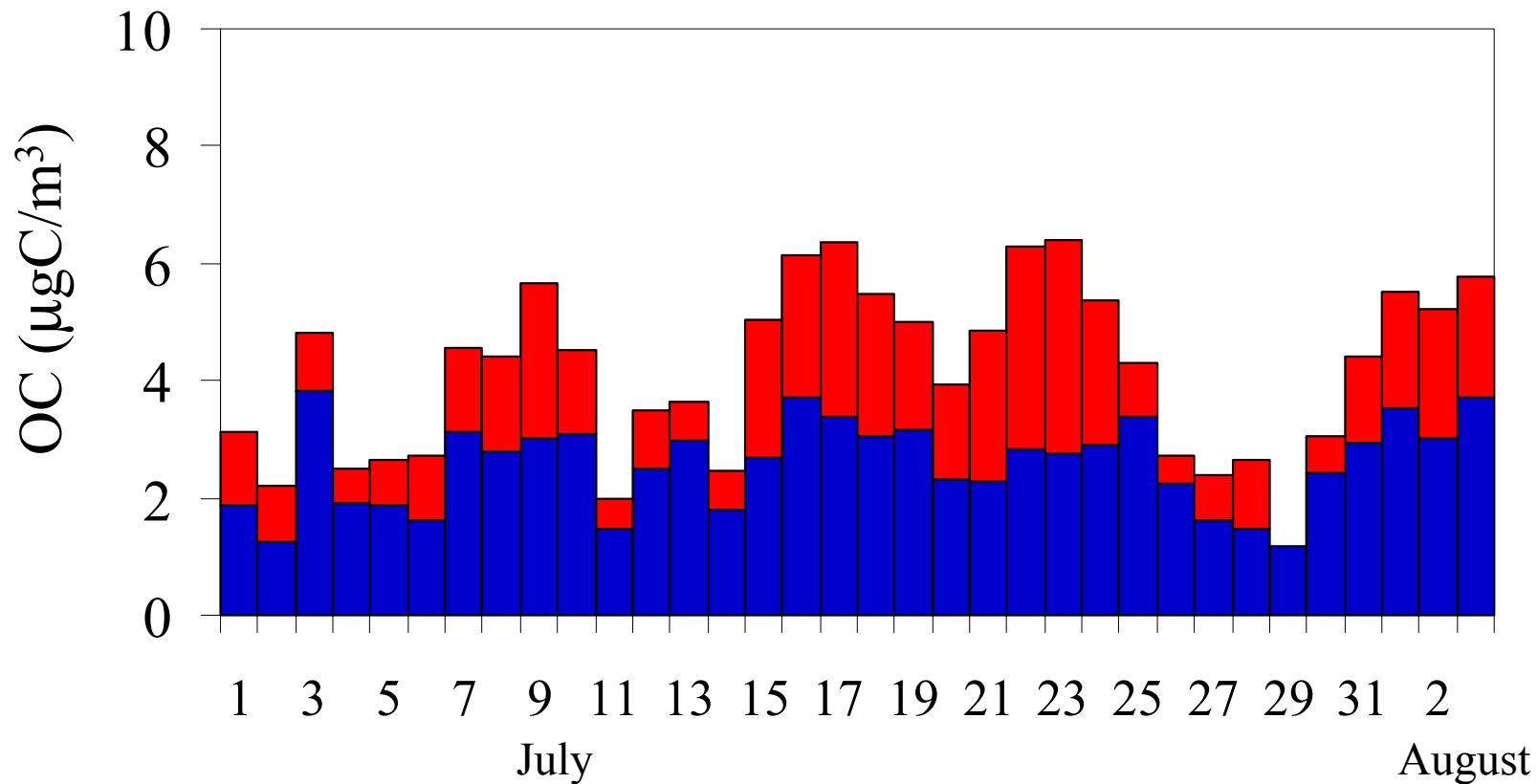
Primary ratio and b



Hourly SOA

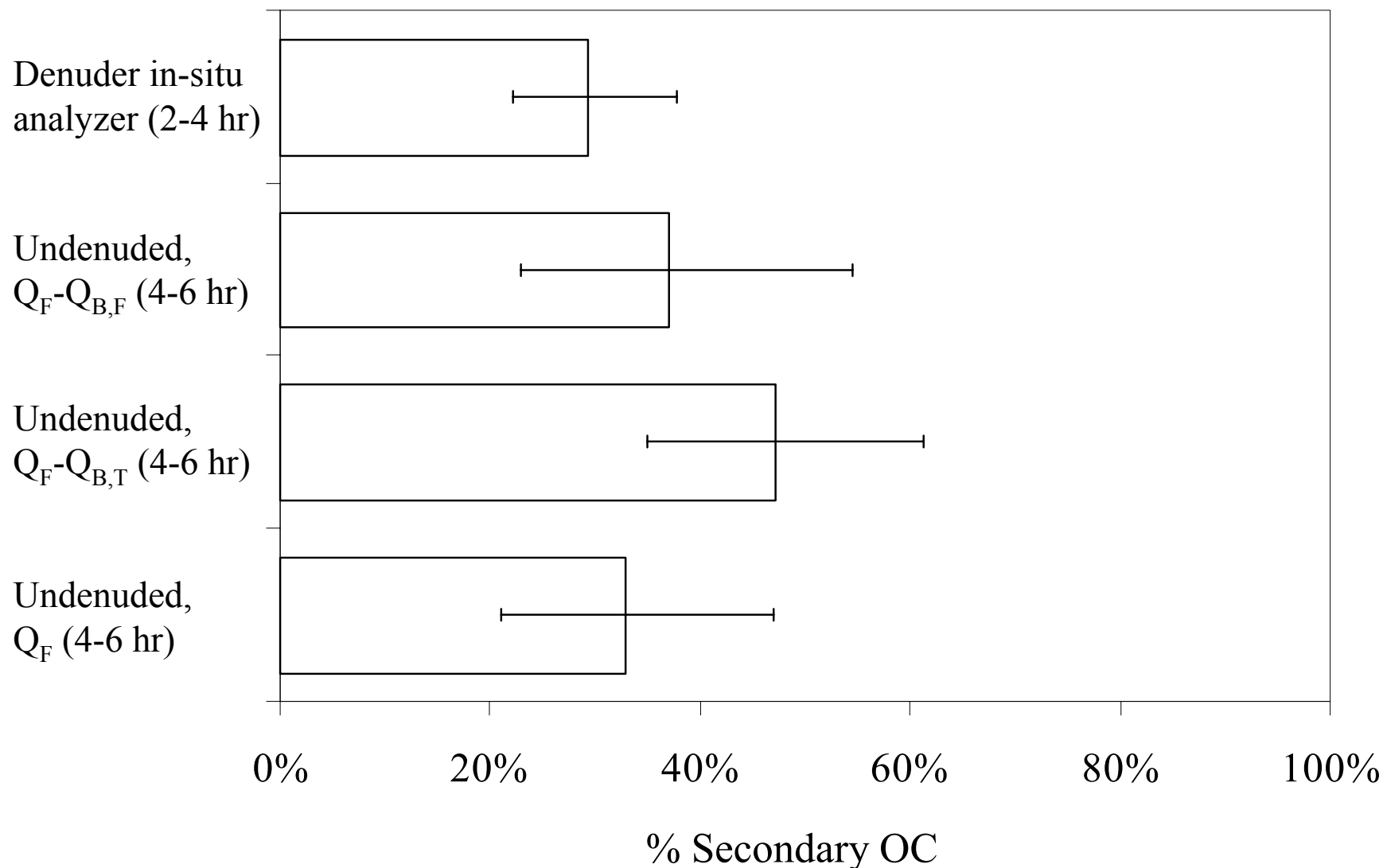


Daily Averaged OC Composition (July 2001)



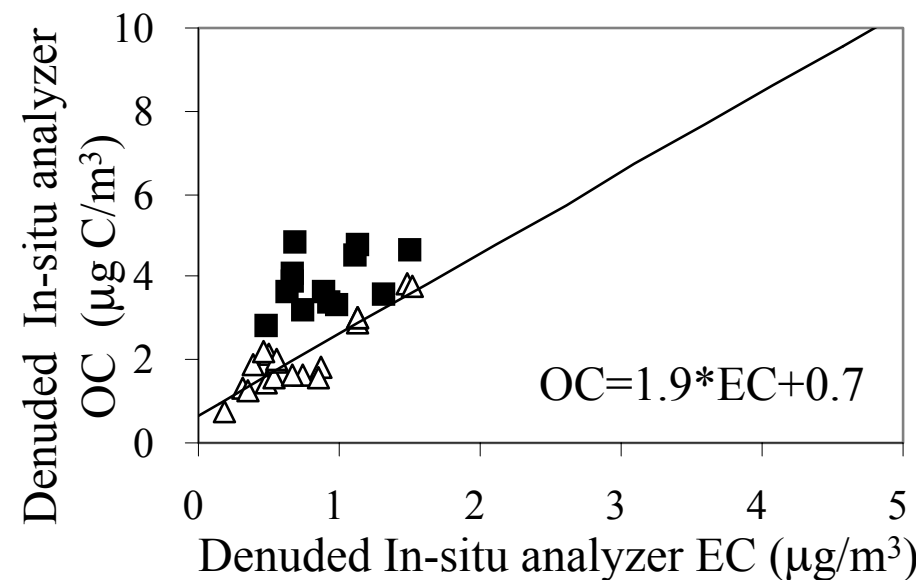
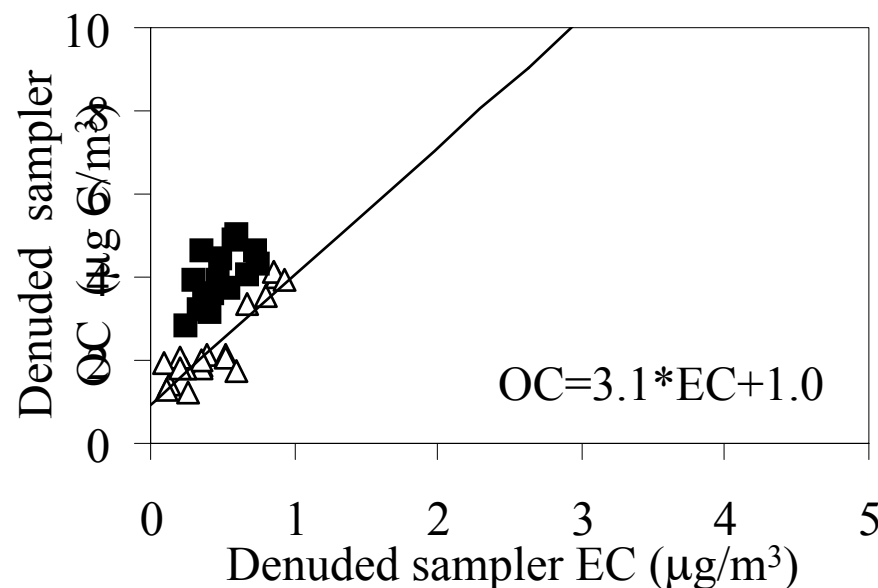
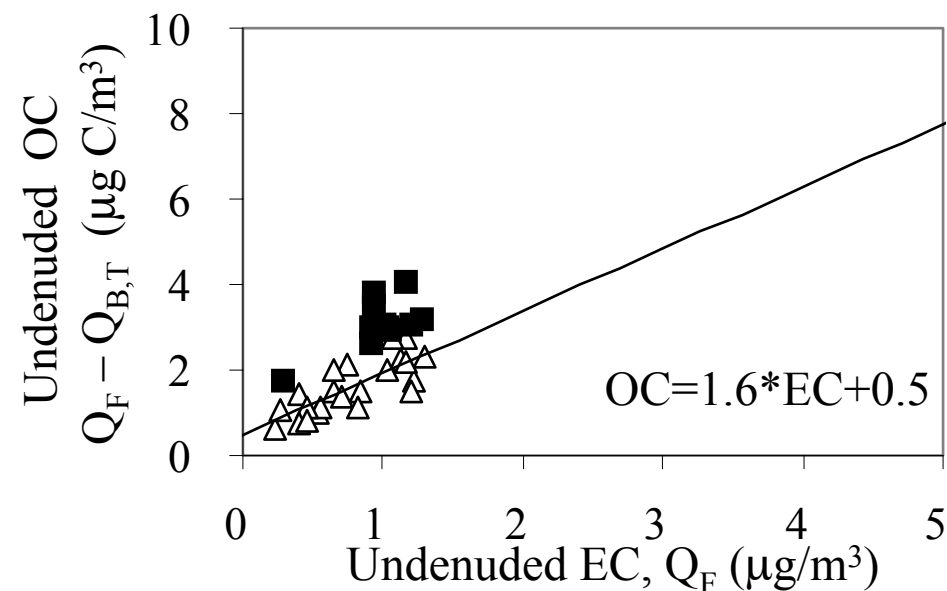
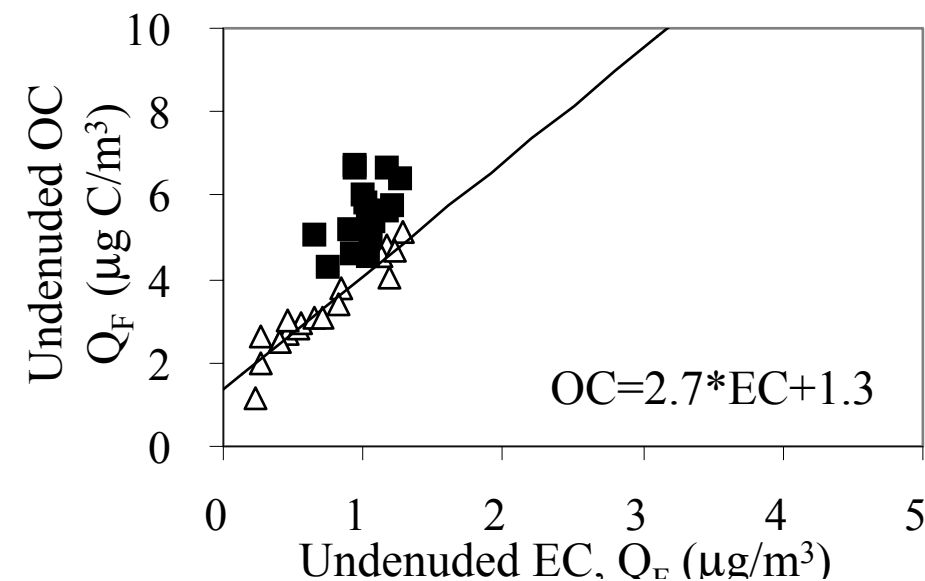


OC Composition, high resolution measurements, summer intensive 2001



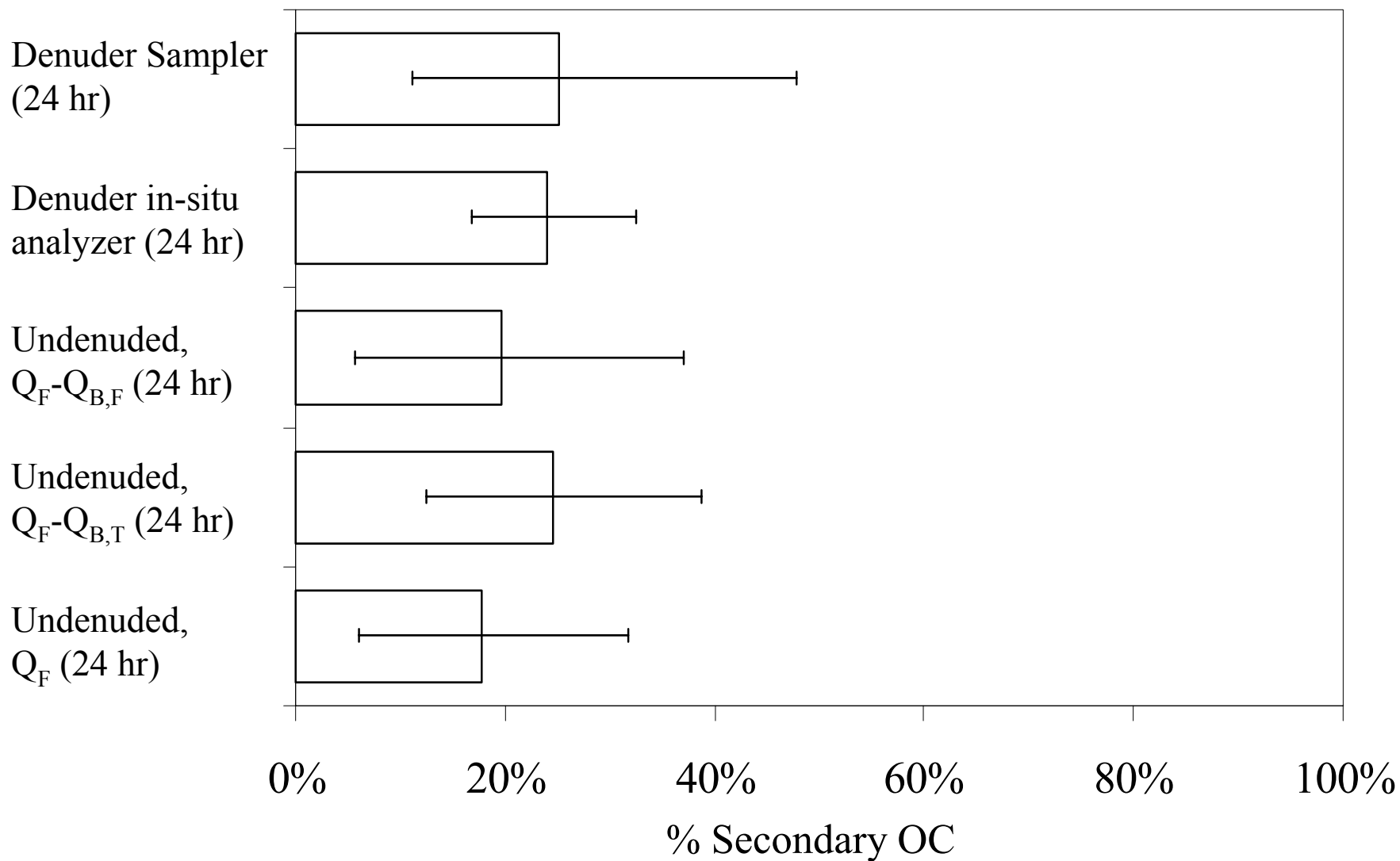


Primary parameters for daily averages concentrations





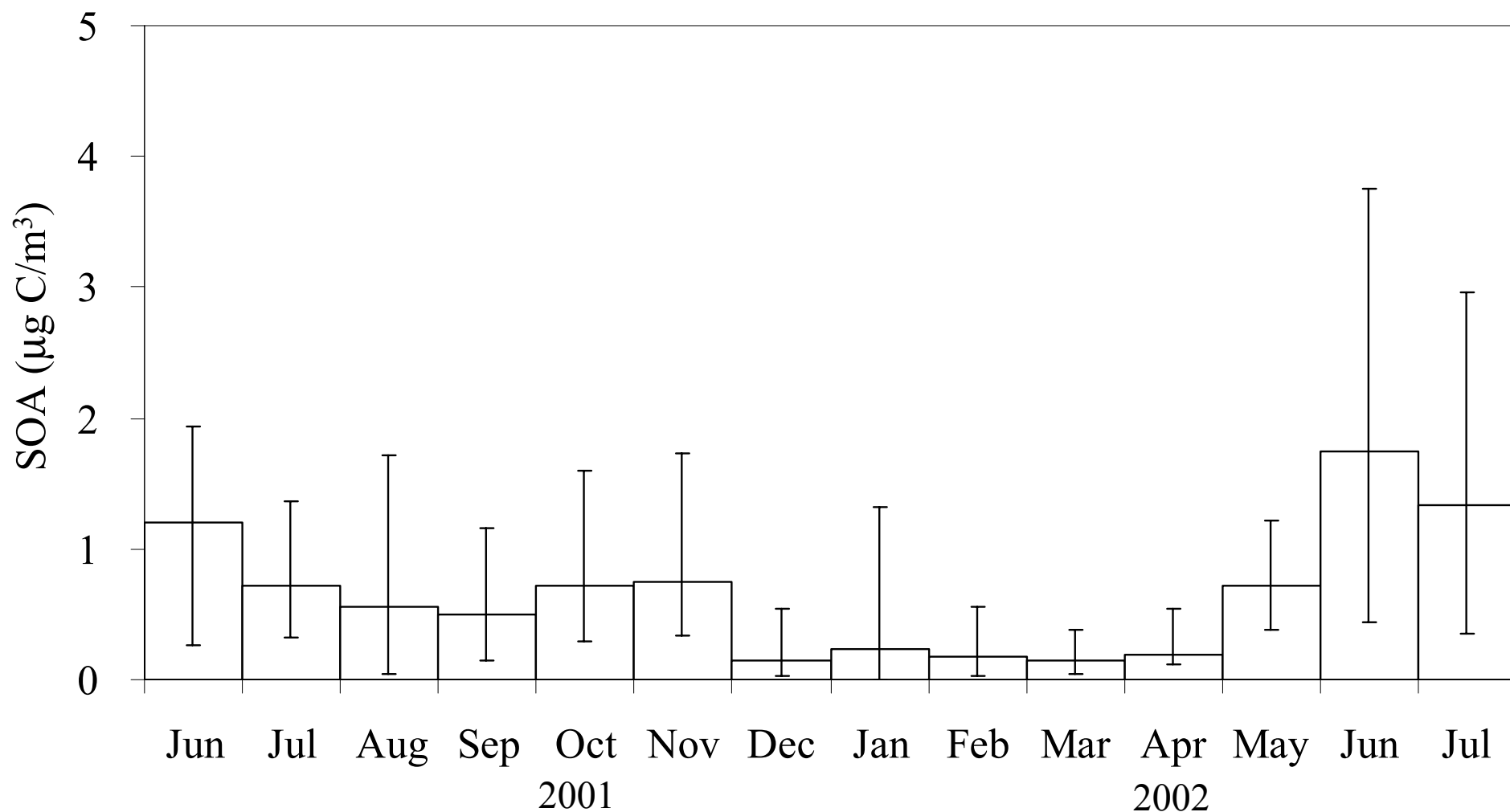
Daily Averaged OC Composition summer intensive 2001





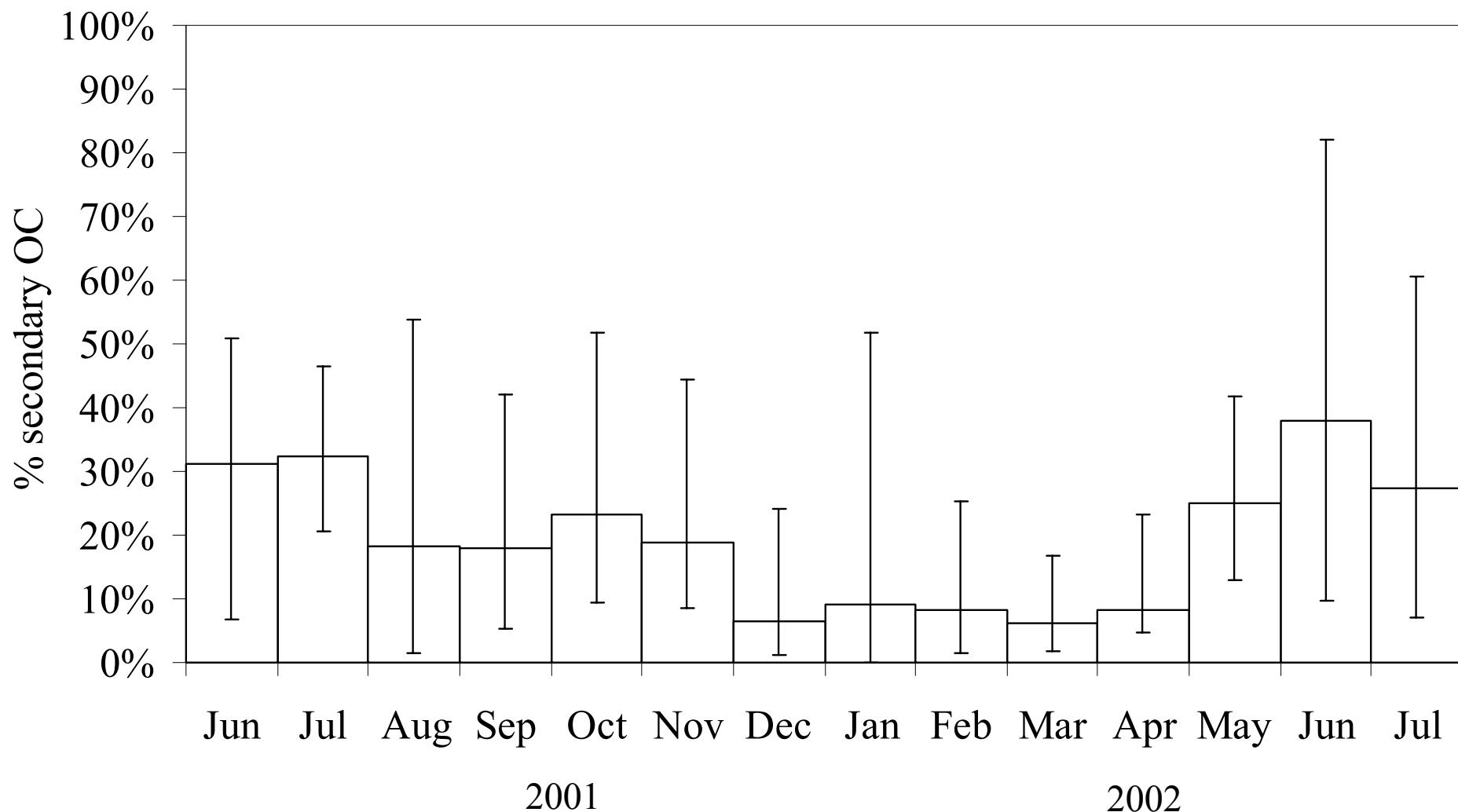
OC and EC measurements (front Quartz)

Monthly Averages (2001/2002)





OC Composition (front Quartz), Monthly Averages (2001/2002)





Conclusions

- Different approaches for EC tracer method give relatively consistent results for the SOA fraction, but different primary ratios and intercepts.
- Higher sampling frequency gives higher estimates of SOA. (Ability to identify periods of primary and secondary OC)
- 20% to 50% of the OC concentration could be secondary in origin during the summer.
- Practically all carbonaceous aerosol primary during the winter and early spring.

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